

CLAIMS

1. A method of treating a fluorocompound-containing gas stream, the method comprising generating a plasma stream from a plasma source gas, injecting the generated plasma stream through an aperture into a chamber, conveying to the plasma stream a source of OH<sup>-</sup> and/or H<sup>+</sup> ions for impinging upon the plasma stream to form heated OH<sup>-</sup> and/or H<sup>+</sup> ions, and conveying the gas stream to the heated ions.
- 10 2. A method according to Claim 1, wherein the plasma source gas comprises an inert ionisable gas, for example, one of nitrogen and argon.
- 15 3. A method according to Claim 1 or Claim 2, wherein the plasma stream is formed by generating an electric field between two electrodes, and conveying the plasma source gas between the electrodes to form the plasma stream.
- 20 4. A method according to Claim 3, wherein one of the electrodes provides at least part of a wall of said chamber.
- 25 5. A method according to Claim 3 or Claim 4, wherein the plasma stream is injected into the chamber through an aperture formed in one of the electrodes.
6. A method according to any preceding claim, wherein the ion source is conveyed to the plasma stream prior to the injection of the plasma stream into the chamber.
- 30 7. A method according to Claim 6, wherein the ion source is conveyed to the plasma stream in a stream comprising the plasma source gas.

8. A method according to Claim 6, wherein the ion source is conveyed to the plasma stream separately from the plasma source gas.
9. A method according to any of Claims 1 to 5, wherein the ion source is conveyed to the chamber.
10. A method according to Claim 9, wherein the ion source is conveyed into the chamber separately from the gas stream.
- 10 11. A method according to any preceding claim, wherein the gas stream is conveyed directly to the chamber for reacting with the heated ions therein.
- 15 12. A method according to any preceding claim, wherein the gas stream is conveyed to the chamber separately from the plasma stream.
13. A method according to any of Claims 1 to 6, wherein the gas stream is conveyed to the heated ions through the plasma stream.
- 20 14. A method according to Claim 13, wherein the gas stream is conveyed to the plasma stream for injection into the chamber therewith.
15. A method of treating a fluorocompound-containing gas stream, the method comprising generating a plasma stream from a plasma source gas, adding the gas stream to the plasma stream, injecting the plasma stream and gas stream through an aperture into a reaction chamber, 25 and conveying to the plasma stream a source of OH<sup>-</sup> and/or H<sup>+</sup> ions.
16. A method according to Claim 15, wherein the plasma source gas comprises an inert ionisable gas, for example, one of nitrogen and argon.

17. A method according to Claim 15 or Claim 16, wherein the plasma stream is formed by generating an electric field between two electrodes, and conveying the plasma source gas between the electrodes to form the plasma stream.

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18. A method according to Claim 17, wherein one of the electrodes provides at least part of a wall of said chamber.

19. A method according to Claim 17 or Claim 18, wherein the plasma

10 stream is injected into the chamber through an aperture formed in one of the electrodes.

20. A method according to any of Claims 15 to 19, wherein the ion source is conveyed to the plasma stream prior to the injection of the plasma stream into the chamber.

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21. A method according to Claim 20, wherein the ion source is conveyed to the plasma stream in a gas stream comprising the plasma source gas.

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22. A method according to Claim 20, wherein the ion source is conveyed to the plasma stream separately from the plasma source gas.

23. A method according to any of Claims 15 to 20, wherein the ion source is conveyed to the plasma stream injected into the chamber.

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24. A method according to any of Claims 14 to 20, wherein the ion source is conveyed to the plasma stream within the gas stream

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25. A method according to any preceding claim, wherein the plasma stream is generated around or below atmospheric pressure.

26. A method according to any preceding claim, wherein the plasma stream is generated using a dc plasma torch.
- 5 27. A method according to any preceding claim, wherein the ion source comprises one of water and water vapour.
- 10 28. A method according to any of Claims 1 to 26, wherein the ion source comprises an alcohol, for example one of methanol, ethanol, propanol, propan-2-ol and butanol.
- 15 29. A method according to any of Claims 1 to 26, wherein the ion source comprises one of hydrogen, a hydrocarbon, ammonia, and a paraffin.
30. A method according to any preceding claim, wherein the chamber is at a temperature in the range from ambient to 1200°C.
- 15 31. A method according to any preceding claim, wherein the chamber is at ambient temperature.
- 20 32. A method according to any of Claims 1 to 30, wherein the chamber is at a temperature in the range from 400°C to 1000°C.
33. A method according to any preceding claim, wherein the chamber is at a pressure in the range from  $10^{-3}$  mbar to 2000 mbar.
- 25 34. A method according to any preceding claim, wherein the ion source is conveyed into the chamber over a catalyst.
- 30 35. A method according to Claim 34, wherein the catalyst comprises one of tungsten, silicon iron rhodium and platinum.

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36. A method according to any preceding claim, wherein the gas stream is subsequently conveyed from the chamber to a wet scrubber.

37. A method according to any preceding claim, wherein the gas stream is subsequently conveyed from the chamber to a reactive media.

38. A method according to any preceding claim, wherein the perfluorocompound comprises one of  $\text{CF}_4$ ,  $\text{C}_2\text{F}_6$ ,  $\text{CHF}_3$ ,  $\text{C}_3\text{F}_8$ ,  $\text{C}_4\text{F}_8$ ,  $\text{NF}_3$  and  $\text{SF}_6$ .

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39. Apparatus for treating a fluorocompound-containing gas stream, the apparatus comprising a reaction chamber, means for generating a plasma stream from a plasma source gas and injecting the generated plasma stream through an aperture into the chamber, means for conveying to the plasma stream a source of  $\text{OH}^-$  and/or  $\text{H}^+$  ions for impinging upon the plasma stream to form heated  $\text{OH}^-$  and/or  $\text{H}^+$  ions, and means for conveying the gas stream to the heated ions.

40. Apparatus according to Claim 39, wherein the means for generating a plasma stream comprises means for generating an electric field between two electrodes, and means for conveying the plasma source gas between the electrodes to form the plasma stream.

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41. Apparatus according to Claim 40, wherein one of the electrodes provides at least part of a wall of said chamber.

42. Apparatus according to Claim 40 or Claim 41, wherein the aperture is located in one of the electrodes.

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43. Apparatus according to any of Claim 39 to 42, wherein the means for conveying the source of OH<sup>-</sup> and/or H<sup>+</sup> ions is arranged to convey the source of OH<sup>-</sup> and/or H<sup>+</sup> ions to the plasma stream prior to the injection of the plasma stream into the chamber.

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44. Apparatus according to any of Claims 39 to 42, wherein the means for conveying the source of OH<sup>-</sup> and/or H<sup>+</sup> ions is arranged to convey the source of OH<sup>-</sup> and/or H<sup>+</sup> ions to the chamber.

10 45. Apparatus according to any of Claims 39 to 44, wherein the means for conveying the source of OH<sup>-</sup> and/or H<sup>+</sup> ions to the plasma stream is separate from the means for conveying the gas stream to the heated OH<sup>-</sup> and/or H<sup>+</sup> ions.

15 46. Apparatus according to any of Claims 39 to 45, wherein the means for conveying the gas stream to the heated OH<sup>-</sup> and/or H<sup>+</sup> ions is arranged to convey the gas stream directly to the chamber.

20 47. Apparatus according to any of Claims 39 to 46, wherein the means for conveying the gas stream to the heated OH<sup>-</sup> and/or H<sup>+</sup> ions is arranged to convey the gas stream to the chamber through the aperture with the plasma stream.

25 48. Apparatus for treating a fluorocompound-containing gas stream, the apparatus comprising a reaction chamber, means for generating a plasma stream from a plasma source gas, means for conveying the gas stream to the plasma stream, means for injecting the plasma stream and gas stream through an aperture into the reaction chamber, and means for conveying to the plasma stream a source of OH<sup>-</sup> and/or H<sup>+</sup> ions.

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